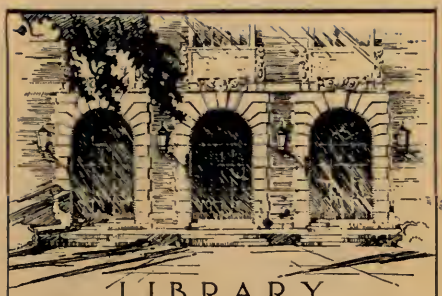

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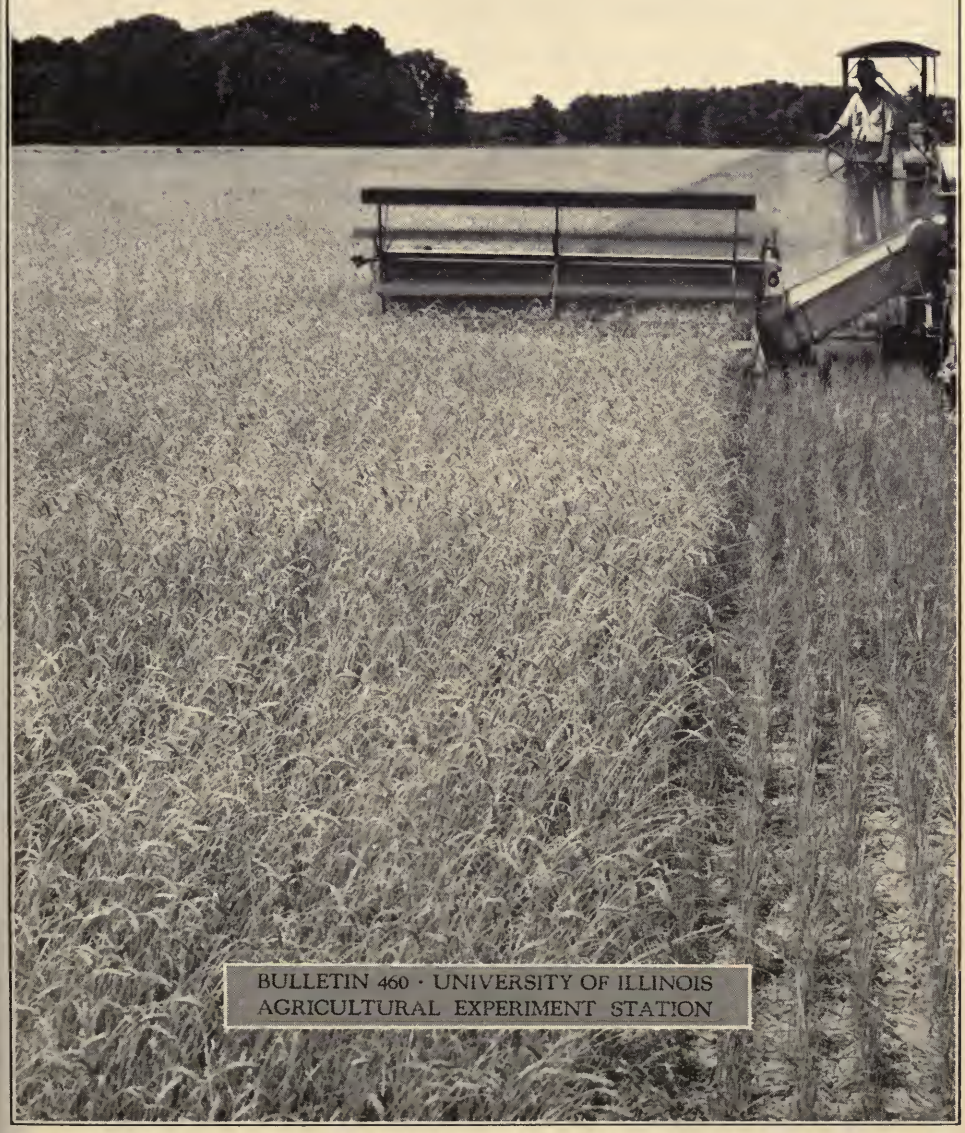
Winter Wheat Varieties *for* Illinois



BULLETIN 460 · UNIVERSITY OF ILLINOIS
AGRICULTURAL EXPERIMENT STATION

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ECONOMY OF PRODUCTION is the aim of state and national agencies in their search for improved varieties of all farm crops. For wheat this means varieties that will give better acre-yields of high-quality grain with greater certainty thru varying seasons. When reduction in total yield of grain is desired, that can be economically obtained only thru reduction of acreage.

Urbana, Illinois December, 1939

Publications in the Bulletin series report the results of investigations made or sponsored by the Experiment Station

Winter Wheat Varieties For Illinois

By George H. Dungan, W. L. Burlison, Benjamin Koehler and O. T. Bonnett[1]

Upward Trend in Illinois Acre-Yields

OF THE FARM CROPS produced in Illinois, wheat ranks fourth in value. During the last thirteen years, 1927-1939, about 95 percent of the Illinois crop was winter wheat and 5 percent was spring varieties. The acreage of spring wheat varies considerably from year to year, being largest in seasons when winter wheat is killed by an unfavorable winter or when wet fall weather prevents seeding the desired acreage of winter wheat.

While the average acre-yield of winter wheat for the United States as a whole has been slightly downward over the last forty-four years, Illinois acre-yields have trended upward (Fig. 1), having increased from a little over 11 bushels an acre for the four-year period 1895-1898 to a little less than 17 bushels for 1935-1938. For the country as a whole the corresponding yields were 14.7 bushels and 12.9 bushels.

Better Varieties One Reason for Better Yields

Factors contributing to this rise in the acre-yield of winter wheat in Illinois are numerous and difficult to analyze. The use of land better fitted for wheat may have been partly responsible for this rise in yield, but varietal improvement must be credited with having played an important part in the increase.

That variety trials at the Illinois Station have paved the way for the introduction of better-adapted varieties into the state is shown by an analysis of the yields on test plots on the Agronomy south farm at Urbana over the last thirty-five years. In the Southwest rotation (corn, oats, clover, and wheat) the variety Turkey has been included during the entire period. Many other promising varieties have been introduced into these trials, and after being tested long enough to demonstrate their producing capacity have been dropped in favor of other promising sorts.

---

[1]George H. Dungan, Chief in Crop Production; W. L. Burlison, Chief in Crop Production and Head of Department of Agronomy; Benjamin Koehler, Chief in Crop Pathology; and O. T. Bonnett, Assistant Chief in Plant Genetics.

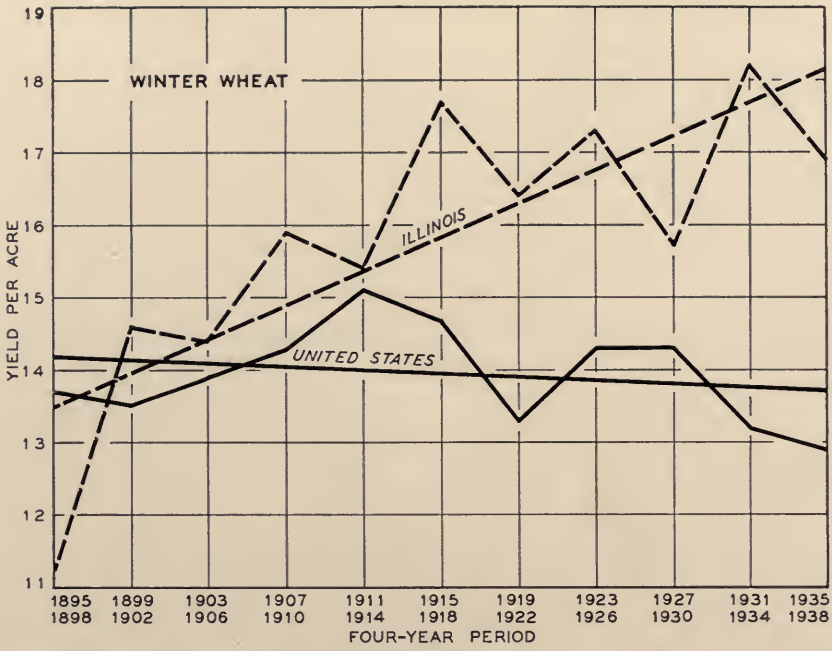

FIG. 1.—YIELDS OF WINTER WHEAT BY FOUR-YEAR PERIODS FROM 1895 TO 1938

Factors which tend to cause wheat yields to climb upward are improvement in varieties, better cultural methods, and increase in productivity of the soil. Factors which pull down the average yields are declining soil fertility, increase in prevalence of diseases and insects.

During the first five-year period the five best varieties yielded 4.4 bushels an acre *less* than Turkey (Fig. 2). In the last five-year period the five best varieties averaged 4.7 bushels an acre *more* than Turkey—a 9 bushel gain during thirty-five years.

Soil Treatment on Test Fields

DeKalb.—The soil on the DeKalb field in northern Illinois consists of a number of types, all of which are common to the region. Since 1924 the rotation has been corn, spring grains, wheat, and soybeans. This field has long received soil treatment. During the past eight years all plots have been given a uniform application of manure at the rate of 8 tons an acre once in each rotation and an application of rock phosphate when soil tests showed a need for phosphorus.

Urbana.—Experiments with wheat at Urbana in central Illinois have been conducted on Muscatine silt loam soil in a rotation of corn,

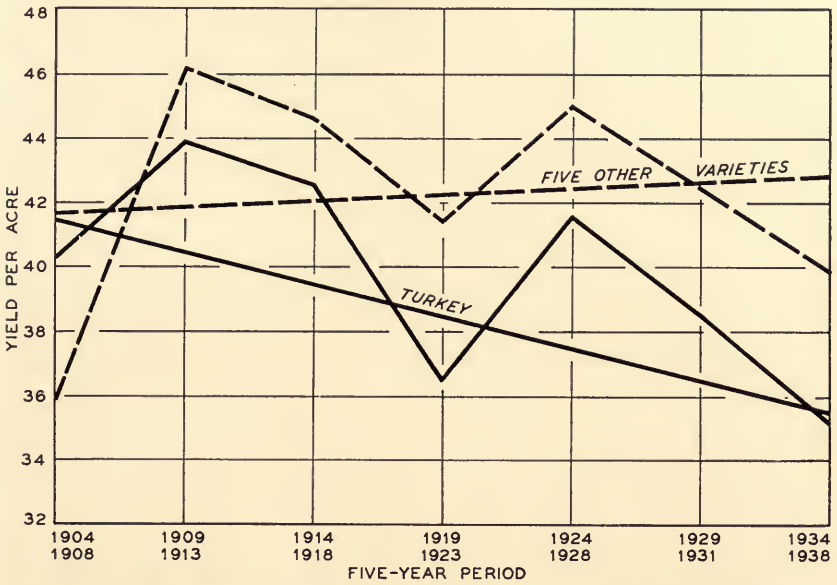

FIG. 2.—YIELDS OF TURKEY AND FIVE OTHER BEST VARIETIES OF WINTER WHEAT IN DRILL-PLOT TRIALS AT URBANA, 1904-1938

For the first four years after it was introduced into the tests, Turkey was the highest yielding variety; but since then the better new varieties have exceeded Turkey. It is evident that distinct improvement has been achieved in the new varieties.

oats, clover, and wheat. In the early years of the tests one end of half the plots received residues and rock phosphate; the other end received residues, rock phosphate, and limestone. One half of the other plots received manure and rock phosphate; the other end of these same plots received manure, rock phosphate, and limestone. Beginning in 1934 the residues have been omitted and manure substituted, so that now all plots receive essentially the same treatment except that to one end of each of them ground limestone has been applied while the other half has received no limestone.

Alhambra.—The soil on the Alhambra field in southern Illinois is Putnam silt loam with numerous "slick" spots. Wheat is now grown in a rotation of corn, oats (sweet clover), soybeans, and wheat (sweet clover). All plots from the very beginning of the wheat trials have been fertilized with crop residues, ground limestone, and rock phosphate.

Highest Yielding Varieties in Illinois Tests

The ability of the varieties included in the Illinois tests during the past fourteen years to produce grain under the conditions of these tests is shown in Tables 1, 2, and 3. Attention is called to the fact that the soil on these fields is free from mosaic virus.

Northern Illinois

On the DeKalb field in northern Illinois, Kawvale, Ioturk, Minturki, Purkof, Illinois 2, Hardy Northern, and Kanred are found at the top of the list, with the following comparable average yields. Other varieties follow these so closely, however, as to leave a very small margin for choice on the basis of yields.

	Bushels per acre		*Bushels per acre*
Kawvale	34.0	Illinois 2	29.7
Ioturk	32.4	Hardy Northern	29.7
Minturki	31.1	Kanred	29.7
Purkof	30.4		

Kawvale is a Kansas wheat which has an excellent yield record in Illinois. For this reason a few Illinois farmers are growing it even tho its grain is only of medium quality for breadmaking. It is susceptible to mosaic disease, however, and sometimes shatters badly while waiting for the combine.

Ioturk, a product of the Iowa Station, is a Turkey type which in addition to a high yield record has good baking quality. This variety is not extensively grown in northern Illinois, however, because of its weak straw. It is also very susceptible to the mosaic disease.

Minturki is grown to a considerable extent in northern Illinois. It is a consistent producer and while not outstanding in any given character, neither is it distinctly inferior in any respect. This wheat was developed at the Minnesota Station.

Purkof, altho only medium in breadmaking quality, is a rather popular variety because of its winter-hardiness, its moderate resistance to lodging, and its freedom from awns. Purkof is very susceptible to mosaic and black stem rust.

Illinois 2 is the highest yielding strictly soft wheat that has been tested on the northern Illinois field. Because of its extreme susceptibility to the mosaic disease, however, it may be expected to decline in acreage. It will be continued in future variety tests merely as a check on the performance of new mosaic-resistant strains which have been selected from it.

Hardy Northern, altho a high-yielding variety in northern Illinois

TABLE 1.—DE KALB FIELD: YIELDS OF VARIETIES OF WINTER WHEAT, 1926-39
(Bushels per acre)

Rank	Varieties	Comparable average yield[a]	Years grown	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939
1	Kawvale	**34.0**	5	....	....	....	....	....	....	....	....	16.8	20.5	44.2	30.8	28.1	....
2	Ioturk	**32.4**	7	....	....	....	....	....	....	18.3	41.6	14.3	20.0	42.4	24.8	29.5	....
3	Minturki	**31.1**	13	43.7	35.2	32.6	34.3	45.4	31.0	9.6	37.6	10.8	25.4	38.4	26.1	25.9	....
4	Purkof	**30.4**	12	46.8	31.8	22.4	37.4	50.5	27.5	12.1	36.3	7.0	26.0	37.9	24.1	....	....
5	Illinois 2	**29.7**	13	....	35.6	26.9	27.8	40.4	24.5	15.3	38.4	9.0	27.5	35.2	27.5	31.8	31.4
5	Hardy Northern	**29.7**	10	44.2	34.0	28.5	28.8	42.3	19.7	15.3	36.3	12.7	24.7	....	....	....	....
5	Kanred C.I. 2401	**29.7**	6	....	35.2	17.4	29.0	48.7	27.9	15.1	....	....	....	....	....	....	....
8	Wisconsin 2	**29.6**	11	....	....	27.8	29.9	43.2	30.5	15.1	38.1	5.2	25.2	35.6	23.4	25.5	....
9	Minnesota Reliable	**29.5**	6	44.2	33.2	18.1	29.2	48.1	29.0	....	....	....	....	....	....	....	....
10	Brill	**29.4**	8	....	....	....	....	....	....	19.8	36.9	8.0	20.6	36.6	24.5	26.2	38.3
11	Tenmarq	**29.3**	7	....	....	....	....	....	....	....	38.9	11.0	14.7	47.2	24.3	19.7	39.8
11	Turkey	**29.3**	14	46.3	35.8	25.5	27.1	43.2	23.4	15.0	36.7	9.1	21.6	40.0	22.5	30.9	33.1
13	Michikof	**29.0**	7	42.0	30.7	22.7	32.3	43.5	28.2	13.5	....	....	....	....	....	....	....
14	Iobred	**28.9**	11	....	....	24.3	32.0	40.9	28.6	15.6	28.3	11.1	27.1	35.6	23.3	26.0	....
15	Ilred	**28.6**	14	51.4	31.4	16.0	28.0	44.8	26.9	14.3	37.4	7.7	21.6	38.1	22.5	26.5	34.1
15	Illinois Winter Fife	**28.6**	6	44.0	32.8	16.9	33.5	47.2	21.1	....	....	....	....	....	....	....	....
17	Iowin	**28.5**	3	....	....	....	....	....	....	....	....	....	....	....	25.1	25.9	34.7
18	Harvest Queen	**28.4**	6	....	....	23.0	29.6	44.9	25.6	13.7	....	....	....	33.6	....	....	....
19	Michigan Amber	**28.1**	6	....	....	11.8	30.3	46.4	26.5	15.2	....	....	....	....	....	....	38.9
20	Ukrainka	**27.4**	4	....	....	....	....	....	....	....	....	....	....	38.7	20.1	20.6	39.8
21	Cheyenne	**27.1**	7	....	....	....	....	....	....	....	35.8	9.7	14.5	44.3	24.7	15.1	36.2
22	Minhardi	**27.0**	4	....	....	....	30.0	44.0	21.1	14.1	....	....	....	....	....	....	....
23	Duffy	**26.8**	4	....	....	....	....	....	....	....	....	....	21.1	39.0	22.1	19.6	....
24	Blackhull	**26.1**	6	46.3	28.7	9.4	24.7	46.0	23.1	....	....	....	....	....	....	....	....
25	Illinois 84	**24.6**	3	....	....	....	....	....	....	....	33.0	9.4	14.3	....	....	....	....
26	Nabob	**22.5**	4	....	....	....	....	....	....	14.9	36.1	7.3	5.2	....	....	....	....
27	Red Rock	**19.8**	3	45.5	19.8	0	....	....	....	....	....	....	....	....	....	....	....

(Table is concluded on next page)

TABLE 1.—YIELDS OF WINTER WHEAT ON DEKALB FIELD—*Concluded*

Rank	Varieties	Comparable average yield[a]	Years grown	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939
	Varieties grown one or two years only																
	Thorne	**33.1**	1	....	....	....	....	....	....	....	....	....	....	....	....	....	42.4
	Clarkan	**32.3**	1	....	....	....	....	....	....	....	....	....	....	....	....	....	41.4
	Wabash	**31.1**	1	....	....	....	....	....	....	....	....	....	....	....	....	....	39.9
	Red Russian	**31.1**	2	46.1	34.7	....	....	....	....	....	....	....	....	....	....	....	....
	Nebraska 1063	**29.5**	2	....	....	....	....	....	....	....	....	....	....	....	....	26.2	37.5
	Illinois 80	**27.7**	1	....	....	....	....	....	....	....	34.8	....	....	....	....	....	....
	Illinois 82	**26.2**	1	....	....	....	....	....	....	....	32.9	....	....	....	....	....	....
	C.I. 8034	**25.9**	1	....	....	....	....	....	....	....	....	....	....	....	....	....	33.2
	C.I. 8215	**25.1**	1	....	....	....	....	....	....	....	....	....	....	....	....	....	32.3
	Fulhio	**20.0**	2	29.1	22.8	....	....	....	....	....	....	....	....	....	....	....	....
	Trumbull	**20.0**	1	30.0	....	....	....	....	....	....	....	....	....	....	....	....	....
	Cornell 133-115	**16.8**	1	....	....	....	....	....	....	....	....	5.6	....	....	....	....	....
	Average yield, all varieties			43.2	31.6	20.2	30.6	45.0	26.0	14.8	36.2	9.6	20.6	39.0	24.4	25.2	36.9

[a]The way in which the *comparable average yield* is calculated is shown by the following example: On the DeKalb field the yield of Thorne in 1939, the only year it was grown, was 42.4 bushels an acre, and the average yield of all varieties that year was 36.9 bushels. Counting 36.9 as 100 percent, the yield of Thorne (42.4 bushels) is 114.9 percent. The average yield for all varieties for 1926-1939 is 28.8. Multiplying 28.8 by 1.149, the product 33.1 is obtained, which is the comparable average yield of Thorne at DeKalb. To obtain the comparative average yield of a variety that has been grown for several years, the annual yields are added together and divided by the sum of the average yields of all varieties for the same years. This gives the percentage relationship. The average yield of all varieties for the entire period is then multiplied by the percentage rating obtained for the variety. The result is the comparable average yield of the variety.

and one possessing good breadmaking quality, is not grown to any extent, perhaps because of its late maturity.

Kanred is another variety of the Turkey type. It is not grown very extensively in northern Illinois, being excelled in acreage by Wisconsin 2, which has a yield record next to it.

Central Illinois

In central Illinois on the Urbana field, Kawvale, Tenmarq, Brill, Wabash, and Duffy rank highest on the basis of yield:

	Bushels per acre		*Bushels per acre*
Kawvale	42.7	Wabash	40.7
Tenmarq	41.5	Duffy	40.1
Brill	40.8		

Thus Kawvale has demonstrated its high-yielding capacity on this field as well as at DeKalb. In spite of its susceptibility to mosaic disease and the ease with which it shatters, some wheat growers have introduced it in this part of Illinois.

Tenmarq is another high-yielding variety originated at the Kansas Station. Excellent in breadmaking quality, its greatest weakness is its extreme susceptibility to the mosaic and scab diseases.

Brill has a very hard-textured grain which is rated high for breadmaking. It is medium in resistance to mosaic and to scab. The greatest weakness of Brill is its tendency to lodge when grown on fertile land. It was developed at the Illinois Station.

Wabash is a promising variety for land infected with the mosaic virus because of its resistance to this disease. It is also remarkably resistant to leaf rust. Wabash has long straw, and on fertile land has a tendency to lodge. It is a product of the Indiana Station.

Duffy is an awned semihard variety carrying considerable resistance to the mosaic disease. It is best adapted to the central part of Illinois; but as soon as new mosaic-resistant strains are available, the production of Duffy will likely decline.

Southern Illinois

At Alhambra in southern Illinois seven varieties—Fulcaster, Brill, Nabob, Red Sea, Purdue 1, Michigan Amber, and Wabash—are in the top group with respect to yield:

	Bushels per acre		*Bushels per acre*
Fulcaster	26.5	Purdue 1	23.9
Brill	24.8	Michigan Amber	23.7
Nabob	24.2	Wabash	23.7
Red Sea	24.1		

(Turn to page 98)

TABLE 2.—URBANA FIELD: YIELDS OF VARIETIES OF WINTER WHEAT, 1926-1939[a]
(Bushels per acre)

Rank	Varieties	Comparable average yield	Years grown	1926	1927	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939
1	Kawvale	**42.7**	6	....	....	....	....	....	....	36.7	34.9	38.3	43.9	29.7	54.8	....
2	Tenmarq	**41.5**	9	....	....	....	....	45.6	42.4	35.0	34.0	35.0	47.1	24.9	53.4	46.6
3	Brill	**40.8**	9	....	....	....	....	46.7	40.8	36.5	38.2	35.8	46.0	16.9	51.4	45.9
4	Wabash	**40.7**	4	....	....	....	....	....	....	....	....	....	45.5	22.5	50.4	45.7
5	Duffy	**40.1**	5	....	....	....	....	....	....	....	39.4	32.6	45.2	21.4	50.1	....
6	Illinois 2	**39.5**	13	52.9	37.9	41.3	48.0	43.0	32.4	34.5	35.7	30.4	44.1	24.6	51.8	36.7
7	Blackhull	**39.2**	8	39.1	38.7	36.7	47.4	44.7	38.6	37.9	35.1	....	....	....	....	....
8	Wisconsin 2	**38.9**	11	....	38.6	37.0	50.1	46.3	41.3	34.5	35.4	29.7	44.2	17.4	46.8	....
9	Cheyenne	**38.7**	8	....	....	....	....	....	43.6	33.2	40.2	28.6	47.9	12.8	49.0	42.0
10	Iowin	**38.5**	3	....	....	....	....	....	....	....	....	....	....	22.7	47.7	41.3
11	Ilred	**38.4**	12	47.2	36.9	33.9	47.4	39.4	38.7	32.9	36.0	28.6	43.5	23.2	50.0	....
12	Purdue 1	**38.3**	4	....	....	....	....	....	....	....	....	32.1	45.4	17.2	....	41.6
13	Indiana Swamp	**38.2**	4	....	37.6	37.9	45.5	40.3	....	....	....	....	....	....	....	....
13	Purkof	**38.2**	12	46.8	39.9	41.4	48.3	45.3	37.9	31.9	33.9	29.2	41.9	12.4	46.4	....
13	Minnesota Reliable	**38.2**	4	45.7	37.1	33.4	45.2	....	....	....	....	....	....	....	....	....
16	Bald Rock	**38.1**	4	....	....	....	....	....	....	35.9	34.1	33.7	39.4	....	....	....
17	Red Rock	**38.0**	5	47.7	36.9	....	....	....	....	....	....	....	....	17.9	44.6	41.5
17	Kanred C.I. 2401	**38.0**	4	51.1	34.4	35.2	....	37.0	....	....	....	....	....	....	....	....
19	Turkey	**37.7**	13	43.1	38.6	36.6	45.1	39.0	38.0	33.8	35.5	31.0	42.6	16.3	50.3	39.8
20	Nabob	**37.6**	8	....	....	....	48.6	43.7	40.5	33.9	32.0	....	....	20.4	46.4	35.5
20	Ioturk	**37.6**	8	....	....	40.5	41.7	45.7	35.0	32.1	34.0	32.2	40.8	....	....	....
22	Michigan Amber	**37.5**	13	37.7	35.5	37.6	47.4	38.7	38.8	34.2	34.8	29.4	40.8	17.9	49.5	45.0
23	Gladden	**37.4**	6	43.3	36.5	36.2	41.2	42.2	38.0	....	....	....	....	....	....	....
24	Illinois 37	**37.2**	3	....	....	....	46.5	40.2	36.4	....	....	....	....	....	....	....
25	Illinois 54	**36.8**	3	....	....	....	46.1	37.6	37.9	....	....	....	....	....	....	....
26	Iobred	**36.7**	10	....	34.4	36.1	42.6	41.5	31.3	34.2	35.1	32.2	40.5	21.0	....	....
27	Fulcaster	**36.5**	5	....	....	38.3	45.7	....	....	....	....	....	....	14.5	46.6	39.8
28	Minturki	**36.3**	10	44.2	34.4	39.3	38.7	38.0	39.4	29.3	33.0	29.0	41.4	....	....	....
28	Penquite	**36.3**	7	....	....	....	45.6	42.8	30.8	30.8	32.9	31.5	41.8	....	....	....
30	Cornell 133-115	**35.9**	3	....	....	....	....	....	....	35.8	30.6	28.1	....	....	....	....
30	Fulhio	**35.9**	6	32.0	34.8	37.9	44.3	....	....	....	....	....	....	22.0	....	37.5
32	Ukrainka	**35.8**	6	....	....	32.5	42.6	....	....	....	....	....	41.2	12.4	50.1	43.0
33	Michikof	**35.7**	6	38.1	34.4	38.6	42.3	32.1	38.1	....	....	....	....	....	....	....
34	Valprize	**35.6**	6	....	....	....	44.1	35.5	39.1	27.0	30.9	34.9	....	....	....	....
34	Nittany	**35.6**	8	....	....	....	....	....	40.8	31.7	27.1	35.9	37.6	14.8	45.9	39.6
36	American Banner	**35.1**	9	....	....	....	....	37.8	36.1	28.5	34.0	34.9	36.2	14.9	46.7	38.6
36	Harvest Queen	**35.1**	9	....	35.9	33.0	46.3	35.2	38.3	30.0	33.4	24.7	....	16.9	....	....

TABLE 2.—YIELDS OF WINTER WHEAT ON URBANA FIELD—*Concluded*

Rank	Varieties	Comparable average yield	Years grown	1926	1927	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939
38	Trumbull	**34.9**	7	31.9	28.5	38.3	43.3	....	....	....	....	....	....	22.6	46.3	37.8
39	Illinois Winter Fife	**34.6**	5	42.6	34.2	32.3	42.8	32.2	....	....	....	....	....	....	....	....
40	Early Premium	**34.1**	4	....	....	....	....	....	....	....	....	....	37.7	19.2	44.4	36.1
41	Hardy Northern	**33.8**	7	40.6	34.7	27.5	40.8	37.5	34.8	28.3	....	....	....	....	....	....
42	Illinois 84	**33.2**	3	....	....	....	....	....	....	29.9	32.9	24.6	....	....	....	....
43	Minhardi	**33.1**	9	....	30.9	34.3	37.8	37.3	33.6	26.6	32.2	25.3	40.2	....	....	....
44	Poole	**31.7**	3	31.2	....	....	42.0	....	....	....	....	....	....	15.6	....	....
45	Arlando	**31.1**	5	....	....	....	....	....	37.3	29.0	17.4	30.0	34.7	....	....	....
	Varieties grown one or two years only															
	Clarkan	**41.0**	2	....	....	....	....	....	....	....	....	....	....	....	55.1	43.2
	World's Champion	**40.1**	1	44.1	....	....	....	....	....	....	....	....	....	....	....	....
	Nebraska 1063	**39.6**	2	....	....	....	....	....	....	....	....	....	....	....	53.2	41.6
	Thorne	**39.2**	2	....	....	....	....	....	....	....	....	....	....	....	50.9	43.1
	Altara C.I. 2048	**39.2**	1	43.2	....	....	....	....	....	....	....	....	....	....	....	....
	Red Russian	**39.1**	2	44.0	36.5	....	....	....	....	....	....	....	....	....	....	....
	Prairie	**38.4**	1	....	....	....	....	....	....	....	....	....	....	....	....	41.3[b]
	Fultz	**38.3**	2	....	....	37.3	45.7	....	....	....	....	....	....	....	....	....
	Nebraska 60	**37.7**	1	....	36.2	....	....	....	....	....	....	....	....	....	....	....
	Shepherd	**36.6**	2	....	....	35.4	44.1	....	....	....	....	....	....	....	....	....
	May	**36.6**	1	....	....	....	43.7	....	....	....	....	....	....	....	....	....
	Illini Chief	**36.2**	2	....	....	36.0	42.6	....	....	....	....	....	....	....	....	....
	Delux Chiefkan	**36.1**	1	....	....	....	....	....	....	....	....	....	....	....	....	38.9
	Nebraska 6	**35.4**	1	....	34.0	....	....	....	....	....	....	....	....	....	....	....
	Illinois 2, Sel. D95	**35.4**	1	....	....	....	....	....	....	....	....	....	....	....	....	38.1[b]
	Ashkof	**35.2**	1	....	33.8	....	....	....	....	....	....	....	....	....	....	....
	Red Sea	**34.9**	2	....	....	36.2	39.6	....	....	....	....	....	....	....	....	....
	C.I. 8034	**34.7**	2	....	....	....	....	....	....	....	....	....	....	....	45.5	37.5
	Kanred × Gladden Sel. 33-1857	**32.6**	1	....	....	....	....	....	....	....	....	....	....	....	....	35.1[b]
	Forward	**31.4**	1	34.5	....	....	....	....	....	....	....	....	....	....	....	....
	C.I. 8215	**31.2**	2	....	....	....	....	....	....	....	....	....	....	....	42.7	32.0
	Durabel	**30.2**	2	....	....	28.6	36.9	....	....	....	....	....	....	....	....	....
	Harvest Queen 28-14	**28.7**	2	....	....	....	....	....	....	....	....	....	34.5	12.4	....	....
	Illinois 2, Sel. D77	**27.4**	1	....	....	....	....	....	....	....	....	....	....	....	....	29.5[b]
	Berkeley Rock	**27.4**	1	30.1	....	....	....	....	....	....	....	....	....	....	....	....
	Malakof C.I. 4898	**26.6**	1	29.3	....	....	....	....	....	....	....	....	....	....	....	....
	Honor	**23.9**	1	26.3	....	....	....	....	....	....	....	....	....	....	....	....
	Average yield, all varieties			40.7	35.5	36.1	44.1	40.4	37.7	32.5	33.6	31.1	41.8	18.7	48.8	39.8

[a]In 1928 at Urbana all varieties were winterkilled except Minhardi, which produced 25.6 bushels an acre.
[b]Average of four plots instead of eight.

TABLE 3.—ALHAMBRA FIELD: YIELDS OF VARIETIES OF WINTER WHEAT, 1926-1939[a]
(Bushels per acre)

Rank	Varieties	Comparable average yield	Years grown	1926	1927	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939
1	Fulcaster	**26.5**	13	20.6	31.1	22.7	16.3	32.0	32.5	17.6	27.3	27.6	33.5	27.1	17.6	33.6
2	Brill	**24.8**	8	....	....	....	....	....	21.8	19.9	26.7	28.0	34.2	29.5	17.6	28.3
3	Nabob	**24.2**	9	....	....	....	....	24.0	26.7	17.4	28.4	30.0	22.9	29.6	20.1	26.6
4	Red Sea	**24.1**	9	....	....	17.3	20.3	25.1	19.5	17.4	26.2	26.9	30.8	29.1	....	....
5	Purdue 1	**23.9**	5	....	....	....	....	....	....	....	....	28.4	32.6	31.0	11.9	31.0
6	Michigan Amber	**23.7**	13	24.9	30.0	18.8	18.5	25.6	23.1	16.3	26.0	27.6	28.8	26.0	18.4	24.1
6	Wabash	**23.7**	4	....	....	....	....	....	....	....	....	....	29.6	30.8	19.1	26.8
8	Kawvale	**23.3**	6	....	....	....	....	....	....	17.7	24.3	28.5	28.8	33.0	16.1	....
9	Fulhio	**23.1**	13	17.2	33.2	19.3	18.1	24.4	17.3	16.1	27.3	27.0	25.7	29.8	15.1	29.5
10	Trumbull	**22.7**	6	16.6	30.2	20.1	16.7	....	....	....	....	....	....	30.9	....	24.8
11	Purkof	**22.3**	9	....	32.0	21.1	19.4	22.5	17.2	16.8	22.6	....	....	24.3	13.7	....
12	Red Rock	**21.7**	5	21.6	26.8	....	....	....	....	....	....	....	....	27.9	15.9	26.2
12	Poole	**21.7**	10	17.6	28.3	18.2	18.8	....	....	17.4	24.9	23.4	26.8	24.5	18.1	....
14	American Banner	**21.5**	8	....	....	....	....	20.3	14.5	14.9	28.6	26.2	23.5	28.2	19.3	....
15	Bald Rock	**21.4**	3	....	....	....	....	....	....	11.8	26.1	27.3	....	....	....	....
16	Illinois 2	**21.1**	10	....	28.8	14.4	15.6	26.1	13.6	16.9	24.2	21.2	24.9	....	....	25.3
17	Early Premium	**20.8**	4	....	....	....	....	....	....	....	....	....	33.5	29.5	9.5	20.8
18	Harvest Queen	**20.6**	5	....	....	14.6	18.2	21.3	17.1	....	....	....	21.3	....	....	....
19	Ilred	**20.5**	6	23.1	28.9	12.3	16.6	15.2	15.7	....	....	....	....	....	....	....
19	May	**20.5**	8	....	....	15.8	14.7	24.4	12.3	14.2	28.0	18.9	26.5	....	....	....
19	Illinois Winter Fife	**20.5**	5	22.4	25.8	12.3	14.0	21.6	....	....	....	....	....	....	....	....

TABLE 3.—YIELDS OF VARIETIES OF WINTER WHEAT AT ALHAMBRA—*Concluded*

Rank	Varieties	Comparable average yield	Years grown	1926	1927	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939
22	Shepherd	**20.4**	4	14.4	30.9	11.3	18.5	....	....	....	....	....	....	....	....	....
23	Nittany	**20.3**	6	....	....	....	....	....	14.9	14.1	23.9	....	....	28.5	15.1	22.7
24	Illinois Special	**19.6**	5	....	....	....	....	21.5	12.4	14.3	25.9	20.5	....	....	....	....
25	Hardy Northern	**15.8**	5	....	24.7	11.6	12.5	14.7	8.4	....	....	....	....	....	....	....
26	Minhardi	**14.4**	4	....	....	12.1	10.1	20.1	4.1	....	....	....	....	....	....	....
	Varieties grown one or two years only															
	Thorne	**26.6**	2	....	....	....	....	....	....	....	....	....	....	....	24.6	27.1
	Gladden	**26.2**	2	25.0	33.2	....	....	....	....	....	....	....	....	....	....	....
	Rattlejack	**25.4**	1	....	....	....	....	25.8	....	....	....	....	....	....	....	....
	Clarkan	**24.7**	2	....	....	....	....	....	....	....	....	....	....	....	23.9	24.1
	Illini Chief	**24.6**	2	22.1	32.7	....	....	....	....	....	....	....	....	....	....	....
	Forward	**24.1**	2	18.3	35.2	....	....	....	....	....	....	....	....	....	....	....
	Lonesack	**23.4**	2	....	....	....	....	....	....	....	....	24.7	32.1	....	....	....
	Michigan Wonder	**23.0**	2	....	....	....	....	....	....	18.3	25.1	....	....	....	....	....
	Fultz	**22.8**	2	....	....	16.4	16.9	....	....	....	....	....	....	....	....	....
	Blackhull	**22.6**	1	20.3	....	....	....	....	....	....	....	....	....	....	....	....
	Duffy	**22.2**	2	....	....	....	....	....	....	....	....	28.9	25.0	....	....	....
	Mediterranean	**18.2**	2	17.1	23.4	....	....	....	....	....	....	....	....	....	....	....
	Rathe	**17.9**	1	....	....	....	....	....	....	....	....	....	....	....	....	20.8
	Average yield, all varieties			20.1	29.7	16.1	16.6	22.8	16.9	16.3	26.0	26.0	28.4	28.7	17.5	26.1

[a]In 1928 at Alhambra all varieties were winterkilled.

Over the entire period of the tests Fulcaster has been the highest yielding variety on this field. Because of its awns it has not been grown as extensively as its merit warrants, but with the more general use of the combine it is likely to replace a part of the Fulhio wheat so generally grown in southern Illinois. Fulcaster is resistant to mosaic.

Brill, altho a hard wheat, does remarkably well in southwestern Illinois.

Nabob has been a consistently high producer on the Alhambra field and is recommended for growing in the central and southern sections of Illinois on mosaic-infected land where the winters are too severe for Fulcaster. It is a product of the Ohio Station.

Red Sea is a synonym for Mediterranean. Altho a very good-yielding wheat, this variety does not possess any outstanding characteristics which make it popular.

Altho Purdue 1 is a soft wheat having good quality and an exceptionally strong straw, it will probably not be widely accepted by farmers because of its extreme susceptibility to the mosaic disease. It is a product of the Indiana Station.

Michigan Amber is a medium-hardy to hardy consistent-producing wheat. It has a stiff straw and carries considerable resistance to mosaic. It is widely grown thruout the central corn belt.

Wabash, because of its good yields and its resistance to mosaic disease and leaf rust, promises to be grown extensively in south-central and southern Illinois.

Fulhio, while not included in the top-ranking varieties on the basis of yield, is a wheat that deserves its present popularity, because of its good milling and baking qualities and its resistance to mosaic disease.

Choosing a Variety to Grow

The ideal wheat has not yet been developed or discovered, but there are three qualities that an acceptable variety must possess: (1) capacity for high yields; (2) a high degree of resistance to prevalent diseases; and (3) good milling and baking qualities. Other desirable qualities are winter-hardiness; resistance to the more destructive insects; lodging resistance even when dead ripe; short straw and early maturity, as these favor the establishment of companion crops; resistance to shattering when fully ripe; and adaptation to soil and climate.

The merits and faults of the varieties included in the Illinois tests during the past fourteen years are indicated in Table 4 (pages 100 and 101). Careful study of this table and the three yield tables will help a grower to choose the variety best suited to his purposes and his growing conditions.

Capacity for High Yields

Only those varieties should be considered seriously for planting that have given good yields for three or more years; for wheats differ in their ability to adjust to the varying conditions of different seasons, and one that does exceptionally well one year may not do so the next.

Resistance to Prevalent Diseases

There are a number of diseases that may from time to time cause significant injury to wheat grown in Illinois. The damage caused by stinking smut is largely determined by the extent to which infection is carried on the seed that is planted and the use of proper seed disinfectants. Mosaic injury occurs only where the soil carries the infection (Fig. 3). Whether certain other diseases, such as leaf rust, stem rust, or scab will be destructive in a given year depends largely on weather conditions.

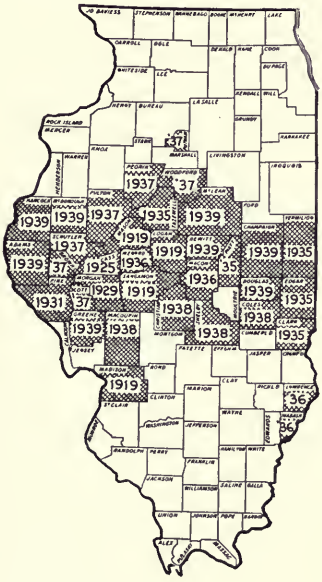

FIG. 3.—WHERE WHEAT MOSAIC DISEASE HAS BEEN FOUND AND YEAR DISCOVERED

That some counties contain much more infected soil than others is certain, altho no farm-to-farm survey has been made. As a rule, infection is more extensive and more persistent on bottomlands than on rolling upland, but severe losses from wheat mosaic on upland have occurred.

In fact, nearly all diseases are influenced by environmental conditions during some part of the growing period of the plant. Environment can be controlled in part. Wheat, for example, need not follow corn on the same soil. By avoiding this sequence, the chances for

TABLE 4.—CHARACTERISTICS OF SEVENTY-SIX VARIETIES OF WINTER WHEAT IN ILLINOIS

	Variety	District of state to which adapted	Relative yield per acre	Grain quality for bread	Lodging resistance	Resistance to disease				Winter hardiness	Grain texture	Heads awned or awnless
						Mosaic disease	Leaf rust	Stem rust	Scab disease			
1	Altara 2048	Central	Medium	Medium	Poor	Good	.....	.....	.....	Excellent	Hard	Awned
2	American Banner	None	Low	Poor	Excellent	Good	[1]V. poor	[1]V. poor	Poor	Good	Soft	Awnless
3	Arlando	None	Low	.....	Good	Good	.....	.....	.....	Poor	Soft	Awned
4	Ashkof	None	Low	.....	Medium	Poor	[1]Poor	[1]Poor	.....	Excellent	Hard	Awned
5	Bald Rock	C and S	Medium	Good	Excellent	Good	[1]V. poor	[1]V. poor	.....	Good	Soft	Awnless
6	Berkeley Rock	None	Low	Medium	Good	Good	[1]Poor	.....	.....	Poor	Semihard	Awned
7	Blackhull	Central	Medium to high	Medium	Medium	Medium	[1]Poor	.....	.....	Medium	Hard	Awned
8	Brill	Central	High	Excellent	Poor	Medium	Medium	Poor	Medium	Excellent	Hard	Awned
9	Cheyenne	Central	High	Medium	Good	Poor	Medium	Poor	Poor	Excellent	Hard	Awned
10	Clarkan	C and S	High	Good	Good	Poor	[1]Good	[1]Poor	Poor	Good	Semihard	Awnless
11	Cornell 133-115	None	Low	.....	Medium	Good	.....	.....	.....	Medium	Soft	Awnless
12	Duffy	Central	High	Medium	Medium	Good	.....	Medium	Medium	Good	Semihard	Awned
13	Durabel	None	Low	.....	Poor	Poor	.....	.....	.....	Medium	Hard	Awned
14	Forward	Southern	Medium	Good	Excellent	Good	[1]V. poor	[1]V. poor	.....	Medium	Soft	Awnless
15	Fulcaster	Southern	High	Good	Good	Good	[1]V. poor	Poor	Medium	Medium	Soft	Awned
16	Fulhio	Southern	Medium	Good	Good	Excellent	[1]V. poor	[1]Poor	.....	Medium	Soft	Awnless
17	Fultz	Southern	Medium	Good	Good	Variable	[1]Poor	[1]Poor	.....	Medium	Soft	Awnless
18	Gladden	C and S	Medium	Medium	Good	Medium	[1]V. poor	[1]V. poor	.....	Good	Soft	Awned
19	Hardy Northern	Northern	High	Good	Medium	Medium	.....	.....	Medium	Excellent	Hard	Awned
20	Harvest Queen	None	Low	Medium	Good	Very poor	[1]V. poor	[1]V. poor	.....	Good	Soft	Awnless
21	Harvest Queen 28-14	None	Low	.....	Good	.....	.....	.....	.....	Good	Soft	Awnless
22	Honor	None	Low	.....	Excellent	[1]V. poor	.....	.....	.....	Medium	Soft	Awnless
23	Illini Chief	Southern	Medium	Medium	Good	Poor	[1]Poor	.....	.....	Medium	Soft	Awnless
24	Illinois 2	Central	High	Medium	Medium	Very poor	Medium	Good	Medium	Excellent	Soft	Awned
25	Illinois 2, Sel. D77	Central	Low	Good	Poor	Excellent	Medium	.....	Medium	Good	Soft	Awned
26	Illinois 2, Sel. D95	Central	Medium	Good	Poor	Excellent	Medium	.....	Medium	Good	Soft	Awned
27	Illinois 37	Central	Medium	.....	Medium	.....	.....	.....	.....	Excellent	Hard	Awned
28	Illinois 54	Central	Medium	.....	Medium	Good	.....	.....	.....	Excellent	Hard	Awned
29	Illinois 84	Northern	Low	Good	Good	Good	.....	.....	.....	Excellent	Hard	Awned
30	Illinois Special	Southern	Low	.....	Excellent	.....	.....	.....	.....	Good	Soft	Awnless
31	Illinois Winter Fife	None	Low	.....	Good	.....	.....	.....	.....	Good	Soft	Awnless
32	Ilred	N and C	Medium	Good	Poor	Medium	Medium	Medium	Medium	Excellent	Hard	Awned
33	Indiana Swamp	Central	Medium	.....	Medium	Very poor	[1]Poor	.....	.....	Good	Soft	Awned
34	Iobred	N and C	Medium	Good	Good	Poor	.....	Medium	.....	Excellent	Hard	Awned
35	Iowin	N and C	High	Good	Poor	Poor	Good	Good	Poor	Excellent	Hard	Awned

TABLE 4.—*Concluded*

36	Ioturk	N and C	High	Good	Poor	Poor	.....	.....	.....	Excellent	Hard	Awned
37	Kanred C.I. 2401	N and C	High	Good	Poor	Poor	Medium	Medium	.....	Excellent	Hard	Awned
38	Kanred × Gladden Sel. 33-1857	Central	Medium	Good	Poor	.....	Medium	.....	.....	Good	Soft	Awned
39	Kawvale	N and C	Very high	Medium	Medium	Poor	Good	Good	Medium	Excellent	Variable	Awned
40	Lonesack	Southern	Medium	.....	Good	.....	.....	.....	.....	Medium	Soft	Awnless
41	Malakof C.I. 4898	None	Low	.....	Poor	Poor	[1]Poor	[1]Poor	.....	Excellent	Hard	Awned
42	May Early Red	Southern	Low	.....	Good	Poor	[1]Poor	[1]Poor	.....	Medium	Soft	Awnless
43	Mediterranean	Southern	Low	Medium	Medium	Good	[1]Poor	[1]Poor	.....	Medium	Soft	Awned
44	Michigan Amber	C and S	Medium	Medium	Good	Medium to good	[1]Poor	[1]Poor	Medium	Medium	Soft	Awnless
45	Michigan Wonder	C and S	Medium	.....	Good	Good	[1]Poor	.....	.....	Medium	Soft	Awnless
46	Michikof	N and C	Low	Good	Excellent	Medium	[1]Medium	[1]Poor	.....	Excellent	Hard	Awnless
47	Minhardi	N and C	Low	Medium	Excellent	Medium	[1]Poor	[1]Poor	[1]Poor	Excellent	Soft	Awnless
48	Minnesota Reliable	N and C	Medium	Good	Medium	.....	.....	.....	.....	Good	Hard	Awned
49	Minturki	N and C	Medium	Medium	Medium	Medium	[1]Poor	Medium	[1]Medium	Excellent	Hard	Awned
50	Missouri Early Premium	Southern	Medium	.....	Good	Poor	[1]Poor	Medium	.....	Medium	Soft	Awnless
51	Nabob	C and S	Medium	Good	Good	Excellent	[1]Poor	[1]Poor	Medium	Good	Soft	Awned
52	Nebraska 6	Central	Medium	.....	Medium	.....	.....	.....	.....	Good	Hard	Awned
53	Nebraska 60	Central	Medium	.....	Medium	Medium	.....	.....	.....	Good	Hard	Awned
54	Nebraska 1063	N and C	High	.....	Medium	Poor	.....	.....	Poor	Excellent	Hard	Awned
55	Nittany	Southern	Medium	Good	Good	Poor	Medium	[1]Poor	Poor	Good	Soft	Awned
56	Penquite	Central	Medium	.....	Good	Poor	.....	.....	.....	Good	Semihard	Awned
57	Poole	Southern	Medium	Poor	Good	Variable	[1]Poor	[1]Poor	.....	Medium	Soft	Awnless
58	Prairie	Central	High	Good	Medium	Excellent	Medium	.....	Medium	Good	Soft	Awned
59	Purdue 1	Southern	High	Good	Excellent	Very poor	[1]Medium	[1]Poor	.....	Good	Soft	Awnless
60	Purkof	N and C	High	Medium	Good	Poor	Medium	Poor	Medium	Excellent	Variable	Awnless
61	Rattlejack	Southern	High	.....	Medium	.....	.....	.....	.....	Medium	Soft	Awned
62	Red Rock	Central	Medium	.....	Good	Good	[1]V. poor	[1]V. poor	Medium	Poor	Soft	Awned
63	Red Russian	N and C	Medium	Medium	Poor	.....	[1]V. poor	.....	.....	Good	Hard	Awned
64	Red Sea	Southern	Medium	.....	Medium	.....	.....	.....	.....	Good	Soft	Awned
65	Shepherd	Southern	Medium	Poor	Medium	Excellent	[1]V. poor	.....	.....	Poor	Soft	Awnless
66	Tenmarq	Central	High	Excellent	Good	Very poor	[1]Poor	Medium	Poor	Good	Hard	Awned
67	Thorne	C and S	High	Good	Good	Excellent	Poor	Poor	Poor	Good	Soft	Awnless
68	Trumbull	Southern	High	Good	Good	Excellent	[1]Poor	[1]Poor	Medium	Medium	Soft	Awnless
69	Turkey	N and C	High	Good	Poor	Medium	Medium	Poor	Medium	Excellent	Hard	Awned
70	Ukrainka	Central	Medium to low	.....	Medium	Poor	.....	Poor	Medium	Good	Semihard	Awned
71	U.S. Hybrid C.I. 8034	Central	Low	.....	Medium	.....	.....	.....	.....	Good	Hard	Awned
72	U.S. Hybrid C.I. 8215	Central	Low	.....	Medium	.....	.....	.....	.....	Good	Hard	Awned
73	Valprize	Central	Medium	.....	Excellent	Good	[1]Poor	[1]Poor	.....	Medium	Soft	Awnless
74	Wabash	C and S	High	Good	Good	Good	[1]V. good	Medium	Medium	Good	Soft	Awnless
75	Wisconsin 2	N and C	High	Good	Medium	Medium	[1]Poor	Medium	Medium	Excellent	Hard	Awned
76	World's Champion	Central	High	.....	Medium	.....	.....	.....	.....	Excellent	Hard	Awned

[1]Rating supplied by R. M. Caldwell, Purdue University.

damage from scab are reduced. But the weather cannot be controlled; and a satisfactory way of clearing up mosaic-infected soil is not known. *The use of resistant varieties, therefore, is the best answer to the problem of controlling wheat diseases.*

Resistance to each individual disease, however, is a separate problem, for resistance to one disease is not necessarily associated with resistance to another. Worse than that, there are geographical influences to be considered—a new wheat found very resistant to leaf rust in Kansas proved susceptible in Indiana. Sometimes, as the result of chance or much work by plant breeders, resistance to two or more diseases is found in the same variety.

Resistance to diseases must be combined with other desirable characters (see page 98) or the variety may still be undesirable. Furthermore, wheat must be suited to the locality. Thus we need not just one variety having all these desirable qualities, but a number of such varieties, one suited to each different geographical location.

Very often the best way to determine resistance to any particular disease or diseases is to set up experimental conditions which practically insure severe infection. This method is being used in studies of

FIG. 4.—A BAD SPOT IN A FIELD OF ILLINOIS PROGENY 2 CAUSED BY WHEAT MOSAIC

This disease makes its appearance in April and is evidenced by a yellowing of plants in small or large areas in the field or over the entire field. Leaves become mottled with light-green or yellow patterns, and the plants fail to grow properly. The degree of stunting and loss of grain depends on the amount of resistance which the variety has. Definite progress is being made in the development of mosaic-resistant varieties.

wheat mosaic in Illinois. Chance infection sometimes yields valuable data on relative resistance and susceptibility to a disease, but it cannot be relied upon every year. Cheyenne, for instance, gave a very good performance from the disease standpoint in the variety trials from 1932 to 1935; but in 1936, in tests on mosaic-infected soil, it was discovered to be very susceptible to this disease, and in 1937 it was almost ruined by stem rust over a wide area. In 1938 in the northern third of the state its yield and quality were cut very severely by scab.

The resistance of the varieties included in these tests to mosaic disease, leaf rust, stem rust, and scab, so far as shown by information now available, is indicated in Table 4.

Milling and Baking Qualities

In rating a wheat on its milling and baking qualities many things must be considered, for these qualities vary not only with the variety but with the fertility of the soil and with the season.

Ease of grinding and percentage of flour obtained are two important elements included in milling quality. Baking quality is determined by the percentage and the quality of the protein in the flour, the percentage of ash, the amount of the water absorbed by the flour when worked into a dough, and the volume, color, and texture of the baked product.

With all these factors to consider, such terms as *excellent, good, medium,* and *poor,* as used in Table 4 to describe the breadmaking quality of the wheats tested, have only a very general meaning. They do, however, have this value—that in so far as milling and baking qualities are to be considered by a farmer when choosing a variety to grow, those varieties described as *excellent* and *good* should always be chosen in preference to those described as *medium;* and those described as *poor* should, except for special reasons, be avoided.

Recommended Soil Treatment for Wheat

Of all of our field crops, wheat is one of the most responsive to treatment with fertilizers, and failures or near failures of wheat due to low soil fertility are frequent.

Mineral fertilizers high in soluble phosphorus have very consistently given yield increases when drilled with wheat on run-down light-colored soils of southern Illinois.[1] On other soils having a low supply of available phosphorus the response for treatment has usually been good.

[1]MILLER, L. B., and BAUER, F. C. Fertilizing Illinois wheat. Ill. Agr. Exp. Sta. Mimeo. Cir. Ag489. May, 1937.

Phosphorus fertilization of winter wheat has given considerable insurance against winterkilling and insect injury.

Potassium has seldom been effective when used alone on wheat, but it frequently gives good results when used with phosphate on soils that are definitely deficient in this element.

The use of nitrogen in mixed fertilizers drilled for wheat has usually not been profitable. Nitrogen-carrying fertilizers may, however, often be used to good advantage as a top dressing in the spring, especially on the poorer soils. While taking advantage of the opportunity of increasing wheat yields by the use of direct fertilization, a farmer must not lose sight of the importance and the economy of raising the general fertility level of his depleted soil by the use of good permanent-fertility practices. For wheat, as for other crops, the maintenance of a good supply of organic matter is important, and rotations should be planned with this as a goal.

Recommended Practices in Growing Wheat

Winter wheat usually follows spring grains or soybeans in the rotation. Sometimes it is seeded after clover or corn. When wheat is to follow spring grain and clover, the land must be plowed in preparation for wheat. Summer plowing is best since it provides an adequate interval for the soil to settle before wheat-seeding time. The land may be plowed 6 inches deep if the work can be done in July, but if on account of the late removal of a crop of clover, plowing has to be done in September, the depth should be not over 4 inches. When wheat is to follow soybeans or corn, little or no work is necessary to prepare a seedbed. A double disking is the most that will be required and sometimes not this much.

The date of seeding is set very accurately by the emergence of the hessian fly. Tests over a period of years show that the highest yields have usually resulted when the seed was planted on or close to the so-called "hessian-fly-free date."

The following conditions and practices help to assure high yields of wheat: (1) a firm seedbed in a fertile soil or one to be fertilized at seeding time; (2) choice of an adapted high-yielding variety; (3) treatment of seed with copper carbonate or Ceresan before it is sown; (4) drilling the seed on or soon after the fly-free date; (5) using 5 to 6 pecks of seed to the acre; (6) rolling the wheat field in the spring after the heaving freezes have past; and (7) harvesting at the proper time.

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